Tactical Ocean Data System (TODS)

- NOe Requirement (from CNMOC 0TB Matrix)
  - Marcus and/or Pam will fill this in.

($K)	FY10	FY11	FY12	FY13	Total
Optical Forecast	165	100	100	0	365
3D Optical Generator	150	100	0	180	430
Exercises	70	50	50	55	225
Northern GOM Test Bed	0	50	0	0	50
Glider Optics / Assimilation	300	0	0	0	300
Total	685	300	150	235	1370

- Technical Accomplishments
  - BioCast 3D Advection Software Completely Integrated into TODS and testing and evaluation underway – results are promising.
  - Fleet MIW Demonstration/Support during HARP Exercise Hawkex April 2012 in Panama City, FL with HM-15, NOMWC and NAVO. Glider optics data collected will be used in FY13 validation of the 3D Optical Generator (3DOG).
  - Fleet ASW Amphibious exercise Bold Alligator (Q2FY12) demonstration in Onslow Bay, SC – fusion of real-time high resolution (250m) satellite optical (diver visibility) and thermal (SST) products and RELO-NCOM numerical model from NP31 for thermal performance surface. Glider optics data collected will be used in FY13 validation of the 3D Optical Generator (3DOG).

- Technical & Financial Issues Encountered & Task Setbacks
  - Discovered issues with high resolution bathymetry anomalies and surface layer flow fields (top Eckman layer) resulting in higher optical properties in coastal regions. Resolved by enhanced bathy processing and spatial averaging techniques. Data set reprocessing and validation currently underway.

Tactical Ocean Data System (TODS)

- Schedule Slips Encountered (as compared to Final FY12 DD 1498)
  - BioCast Transition and VTR delayed 3-4 months (Q1FY13 - 80% Complete) OpTest will follow.

- **FY12 Funding Execution Rate:**
  - Expect full FY12 funding exhaustion by 30NOV12

$150.0K (FY12)	**15-Oct-12**
PI Expenditure	$112.0K (75%)
PMW 120 Expenditure	$0.0K (0%)

Tactical Ocean Data System (TODS)

- Transition path & Way Ahead:
  - Future transitions of TODS components: BioCast, 3D Optical Generator (3DOG) and AQS-24 System Performance Surfaces will reside with NAVOCEANO NP33
  - BioCast validation / VTR underway and transition is planned for Q1FY13. OpTest at NAVO will follow. 3D Optical Generator (3DOG) transition/VTR currently on schedule for Q4FY13.
  - This task will be completed in Q4FY14 with full TODS capability to support MIW, ASW and SpecOps with nowcast and forecast 3D optics and performance surfaces.
  - No transition issues currently perceived.
  - Transition plan status: FY12 TP exists and FY13 TP is in progress.

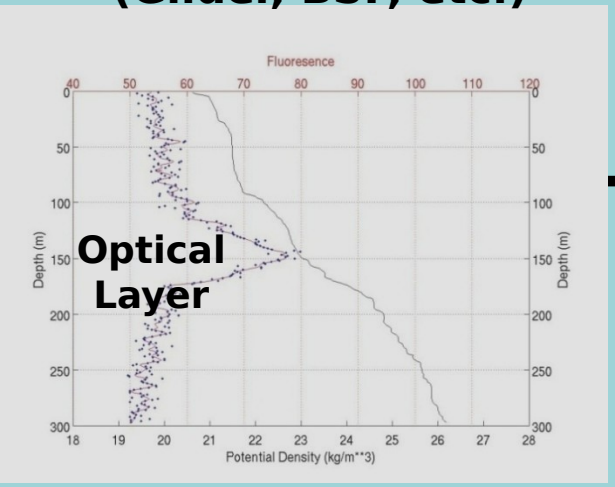
Tactical Ocean Data System (TODS)

- PI comments:
  - Fleet MIW demonstrations and evaluations to date has proven beneficial in support of Navy ASW and MIW operations and planning.
  - Successful forecasting laser imaging system (AQS-24) performance field.
  - Continued fleet request ongoing for ASW & MIW.
  - For the amount received this project gives a huge return on investment.

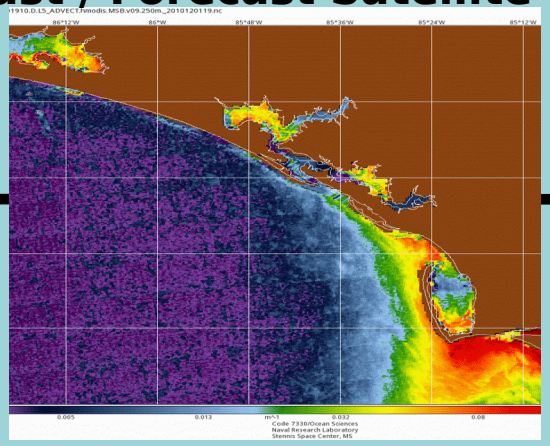
- Project Manager Comments and NOe discussion items
  - Marcus will fill this in.

Fusion of Glider Profiles, Satellite and Numerical Models to support AQS24 Operations

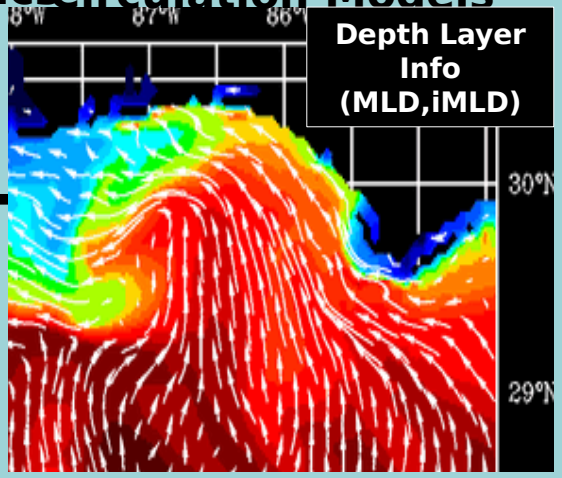
Vertical Optical Profiles (Glider, BSP, etc.)



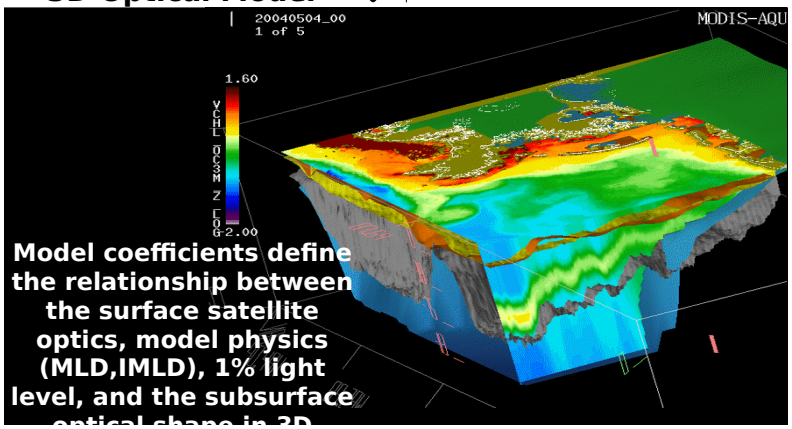
Nowcast / Forecast Satellite Optics



Nowcast / Forecast Circulation Models



Insitu Optics Used for Tuning Coefficients in 3D Optical Model

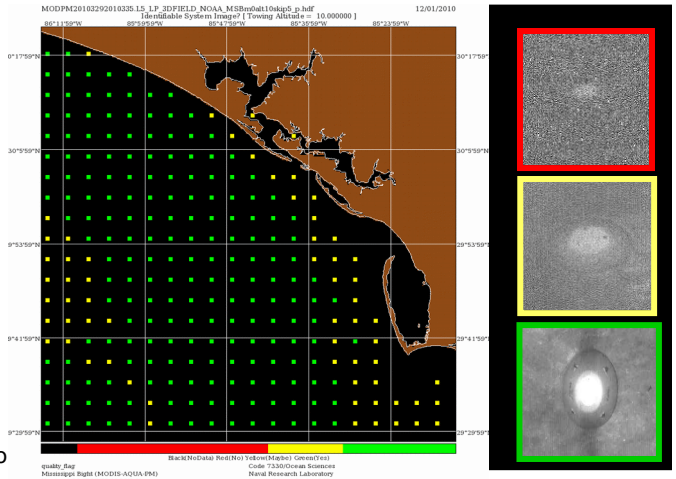


Model coefficients define the relationship between the surface satellite optics, model physics (MLD,IMLD), 1% light level, and the subsurface optical shape in 3D

EODES

Nowcast/Forecast Performance Surfac

Image Quality & Optimal System Towing Altit



Optical Volume & 3D Diver Visibility

NGOM Test Bed
(MissBight)

Imagery Combined
w/ Circulation Models

OpCast/BioCast
Comparison

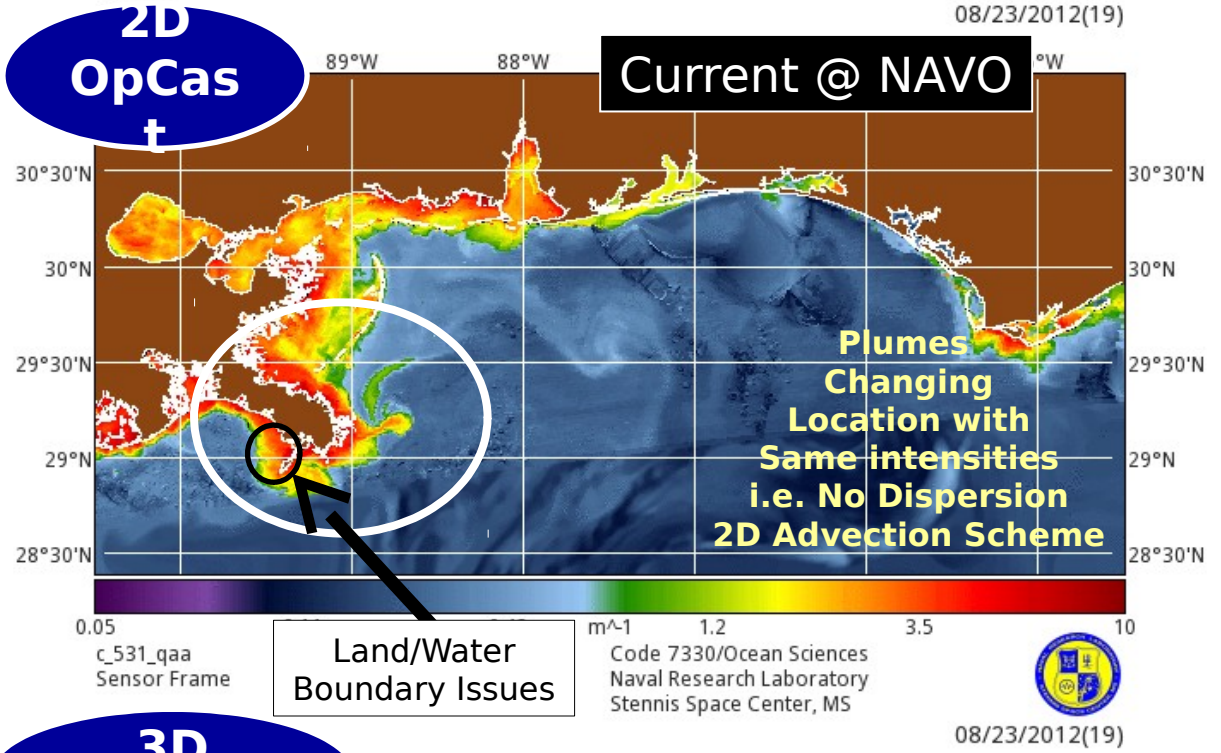
24 Forecast Animation
@ 3 Hour Time Steps

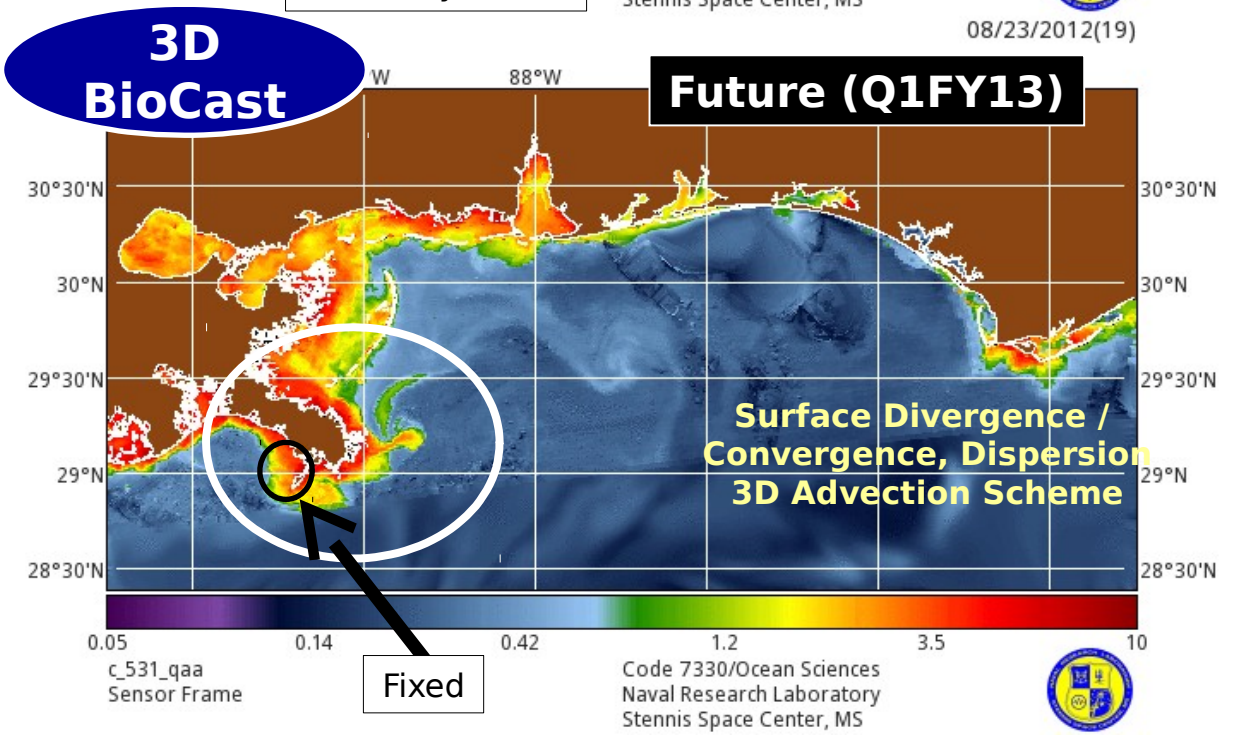
Satellite: MODIS Chl1km
Model: RELO-NCOM
AMSEAS 3km

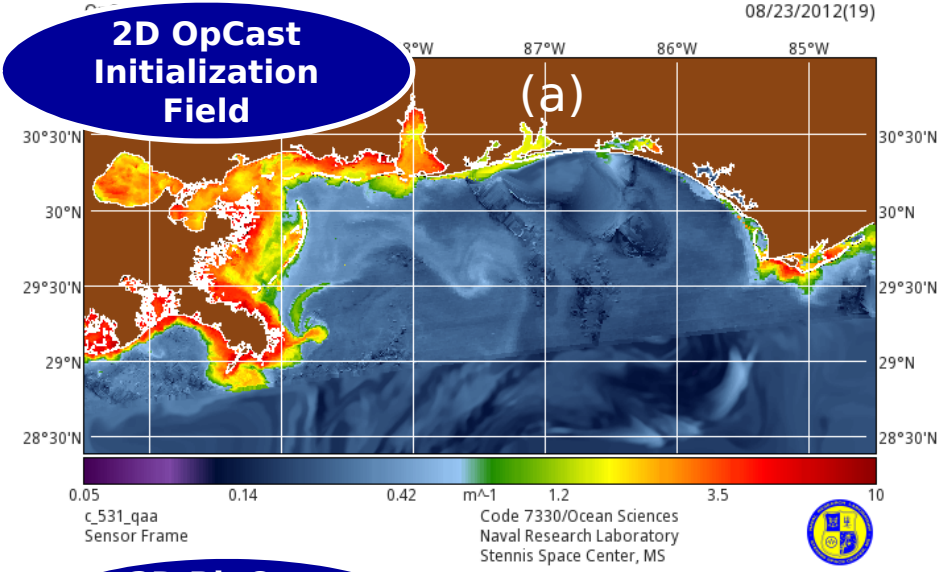
August 24, 2012

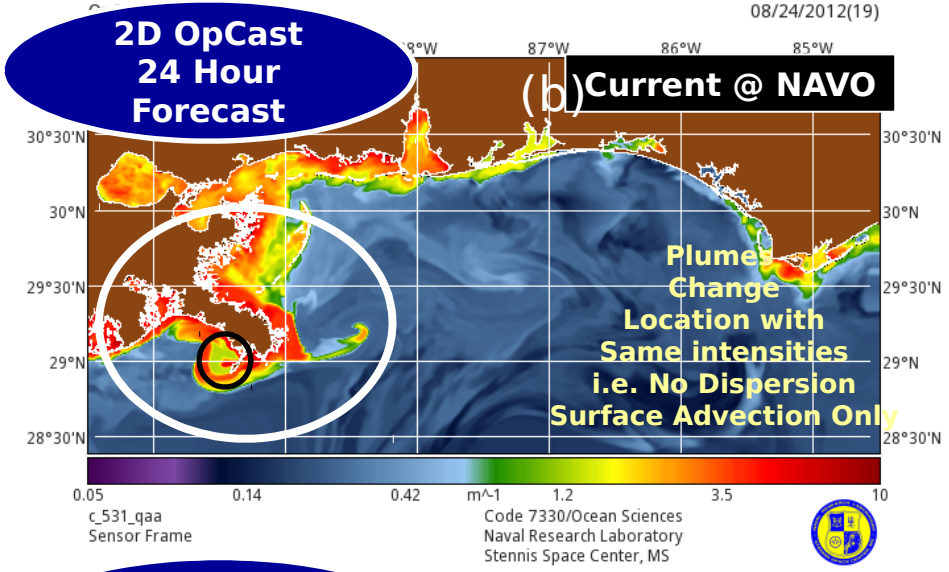
BioCast/TODS
Integration Complete
Validation Underway

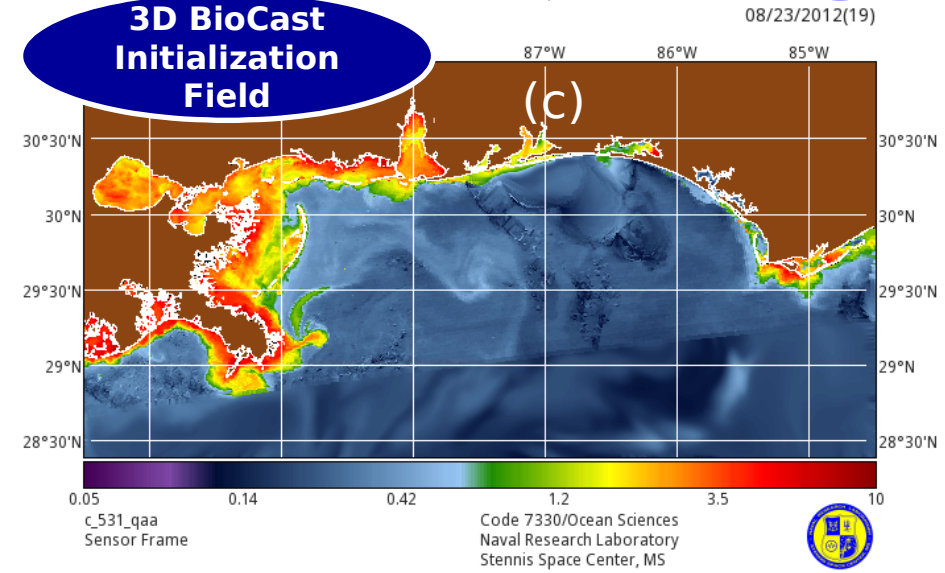
Running Operationally
@NRL (OpCast & BioCast)
Since Sep. 01, 2011

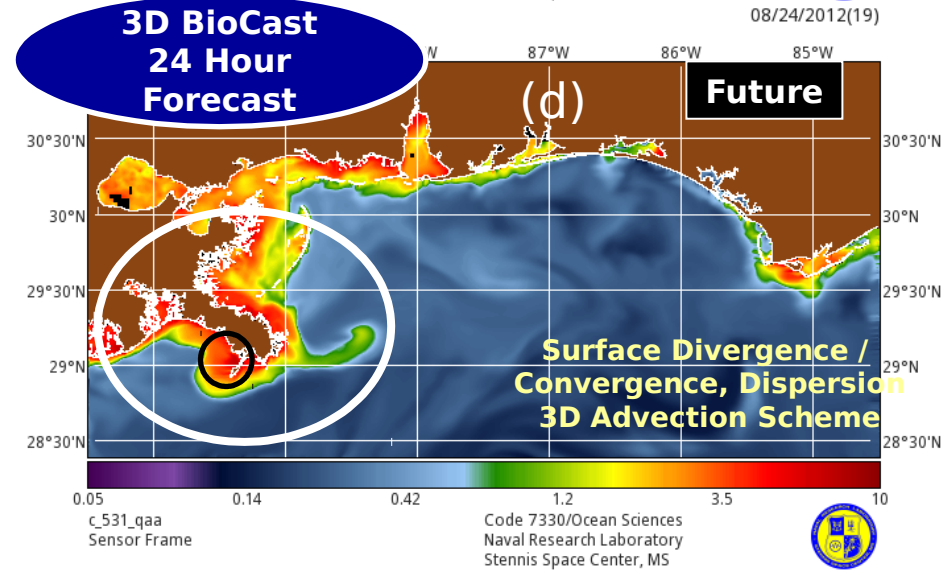












Optical forecast comparison between OpCast and BioCast for turbidity using MODIS Aqua (08/23/12) and coincident RELO-NCOM model. The satellite initialization optical field for the 2D advection software OpCast (a) and the 3D advection software BioCast (c) was used to produce the 24 hour optical forecasts for OpCast (b) and BioCast (d). Improvements in the new 3D BioCast due to land/water boundary issues (small black circle) and the 3D currents/tracer advection scheme (large white circle) is illustrated in the 24 hour forecast images (b,d).

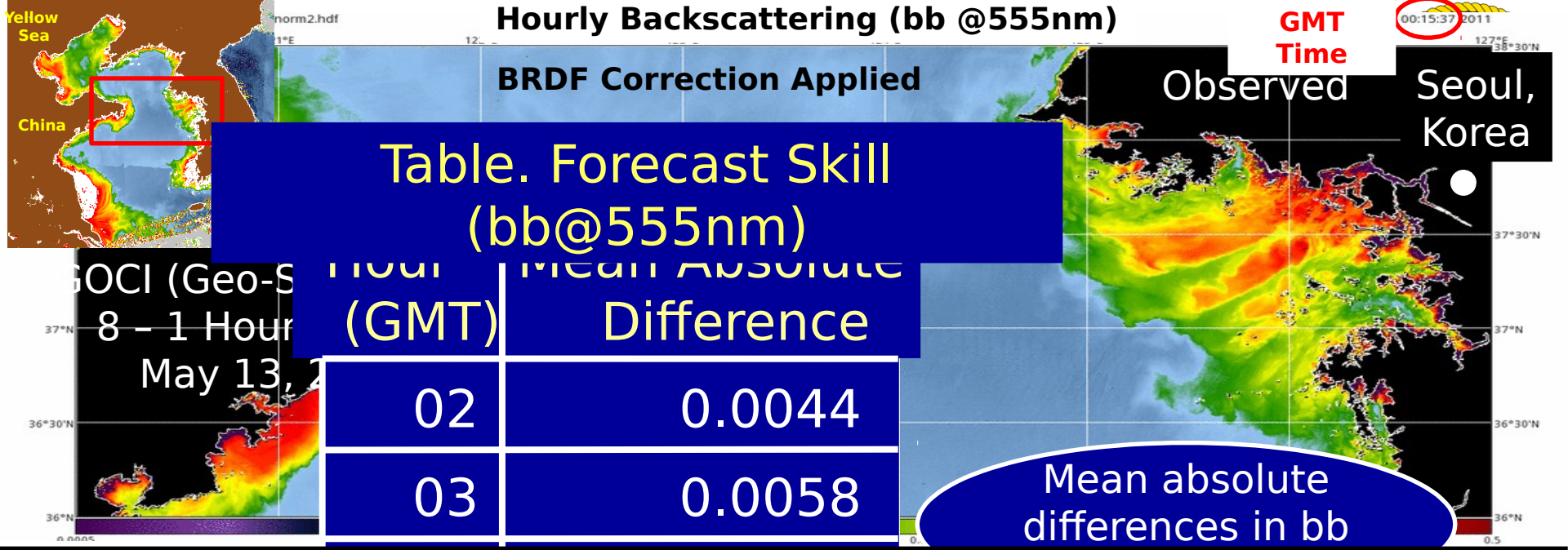


Table. Forecast Skill (bb@555nm)

Hour (GMT)	Mean Absolute Difference
02	0.0044
03	0.0058

Mean absolute differences in bb

Bold Alligator
January 30 – February 13, 2012
Onslow Bay, NC

NRL provided near-real-time satellite support products as a capability demonstration to a large-scale U.S. naval amphibious exercise - Bold Alligator (BA12). These products were developed using the TODS system by merging satellite optical and thermal properties, high resolution model and glider positions.

Products provided:

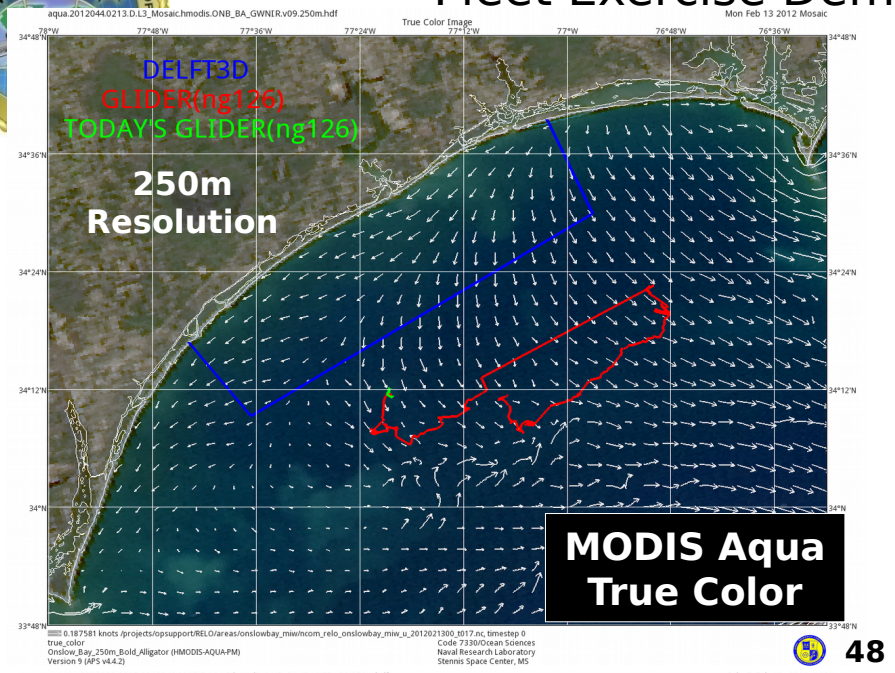
- Regional True Color (R,G,B) image from Aqua MODIS at 250m resolution with the following model and glider information overlaid: NCOM 500m resolution surface currents, operational boxes, and glider tracks.

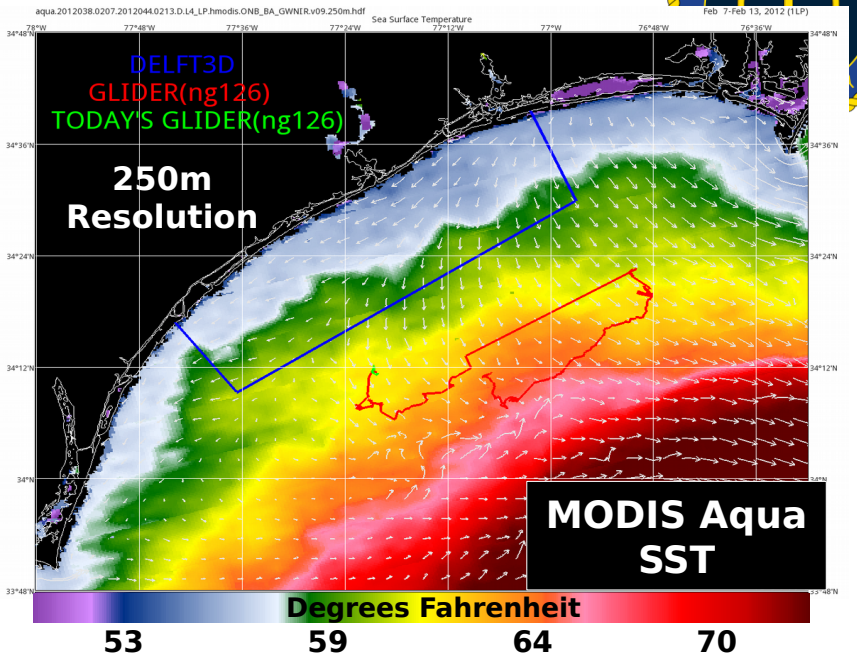
- Regional Sea Surface Temperature (SST) image in degrees Fahrenheit derived from Aqua MODIS at 250m resolution with the same model and glider overlays.

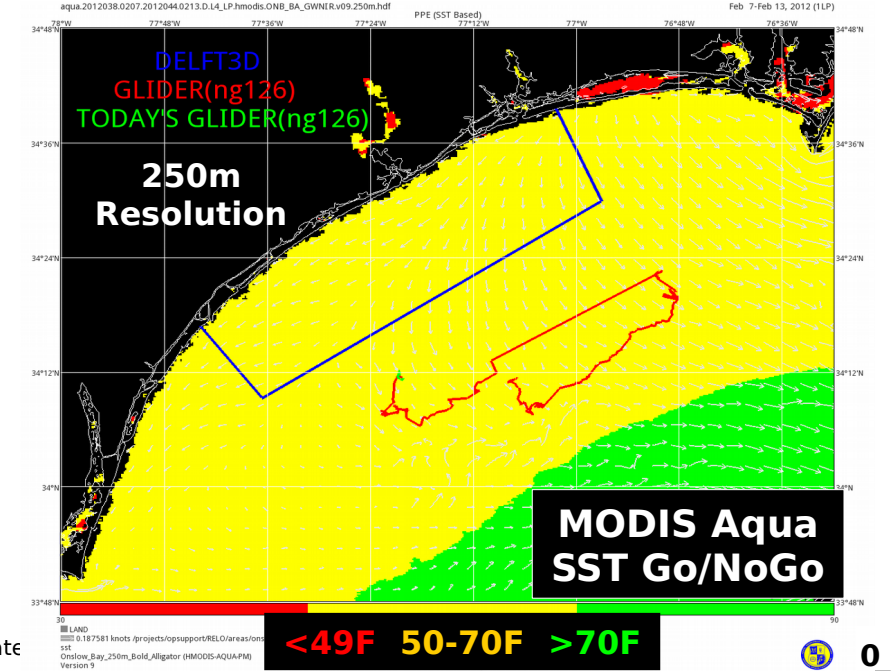
- PPE Go/No-Go (Sea Surface Temperature based) image in degrees Fahrenheit derived from Aqua MODIS at 250m resolution with the same model and glider overlays. (<49F, 50-70F, >70F)

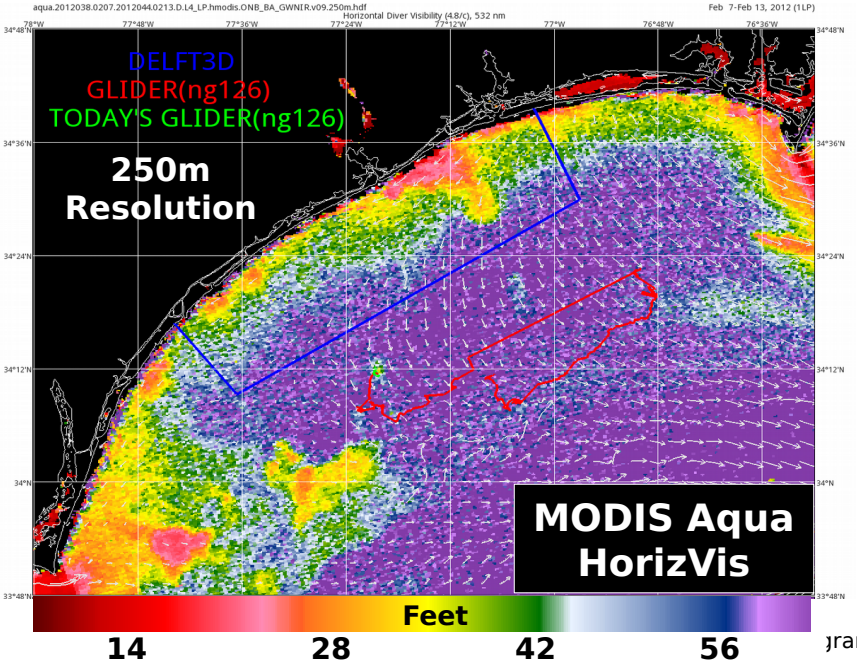
- Regional horizontal diver visibility image in meters derived from Aqua MODIS at 250m resolution with the same model and glider overlays.

Bold Alligator ASW Amphibious Fleet Exercise Demonstration 2/13/12





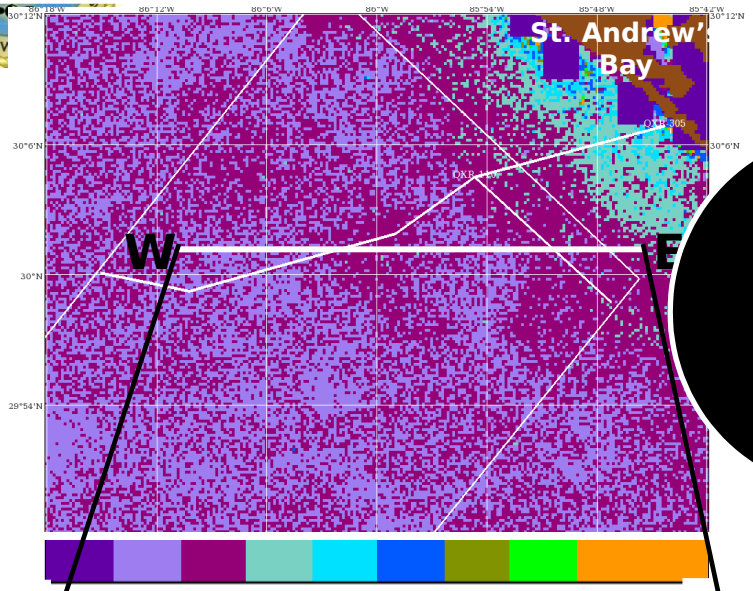




owcast AQS-24 Support for HAWKEX Valid October 03, 2014 19Z

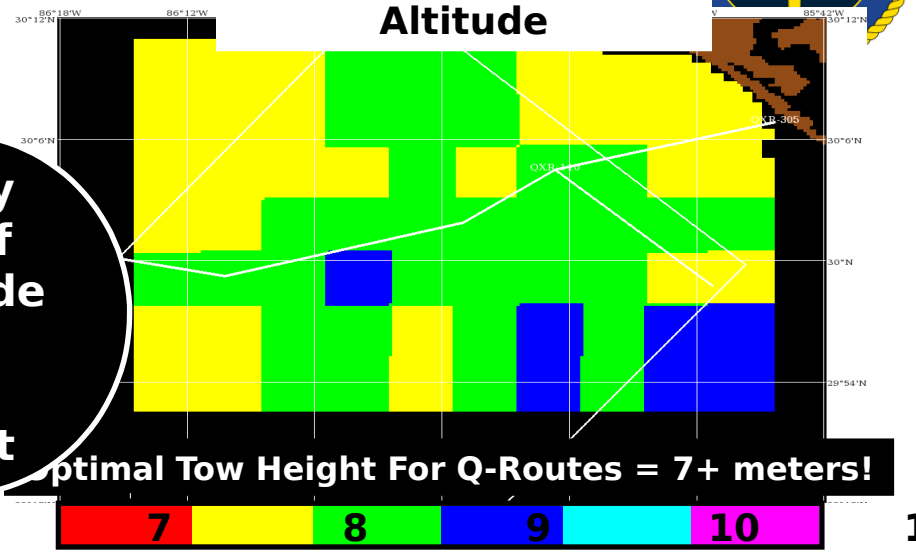
Panama City, FL

Surface Beam-c / Diver Visibility

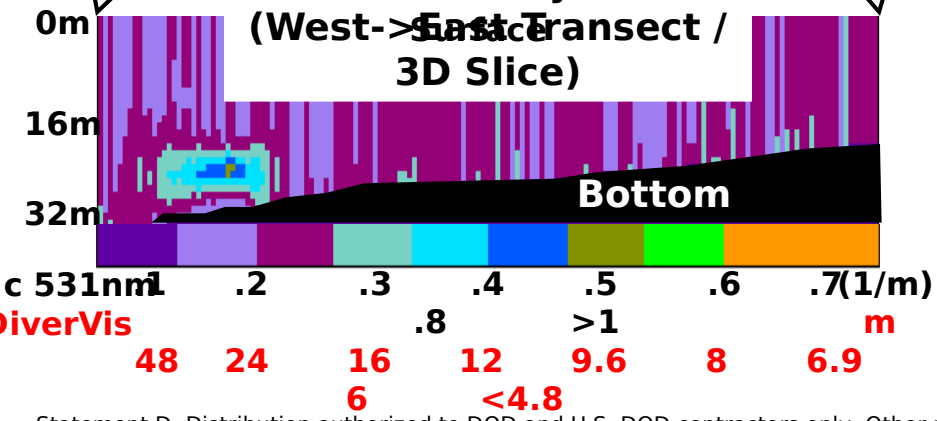


Daily Brief Provided To Fleet

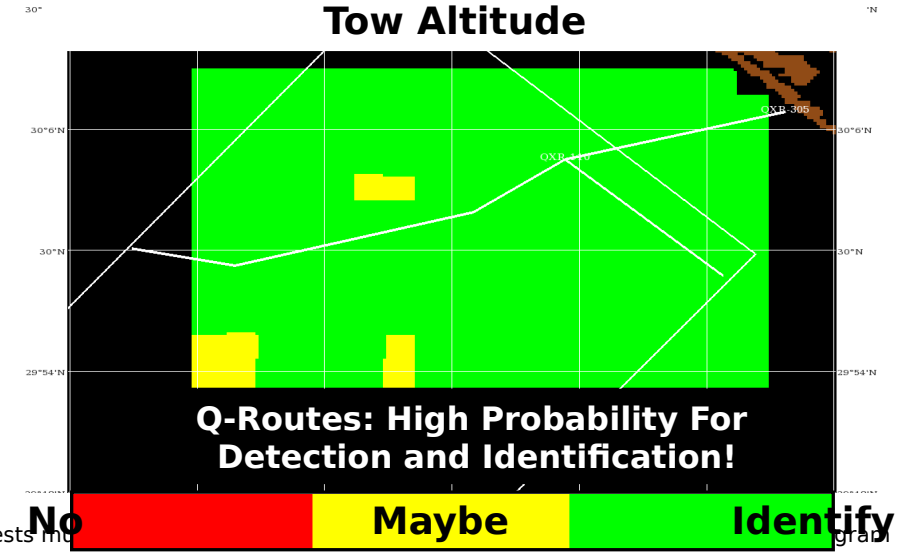
Optimal Tow Altitude



3D Beam-c / Diver Visibility (West->East Transect / Surface 3D Slice)



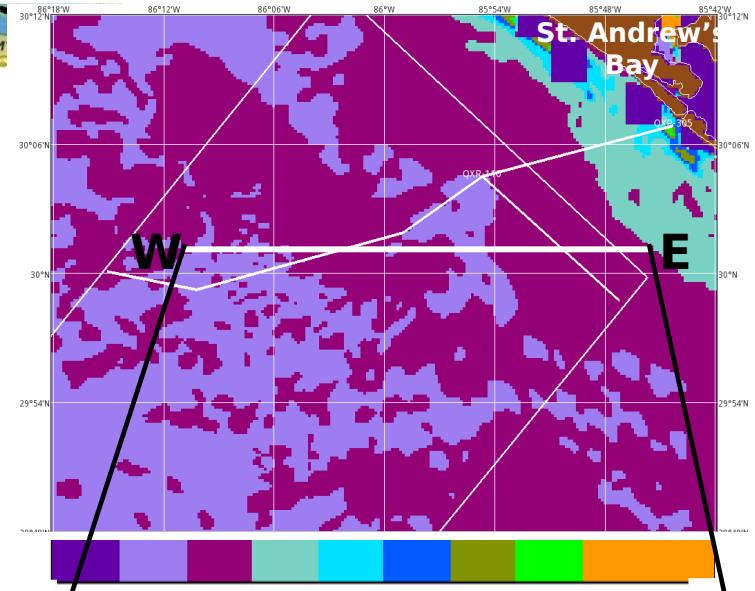
Target Identification @ 7m/23.0ft Tow Altitude



HR Forecast AQS-24 Support for HAWKEX Valid October 07, 2015

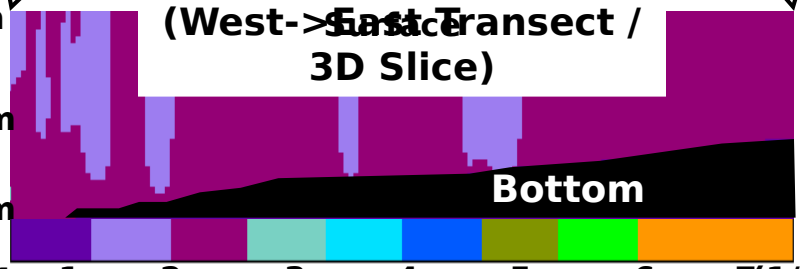
Panama City, FL

Surface Beam-c / Diver Visibility



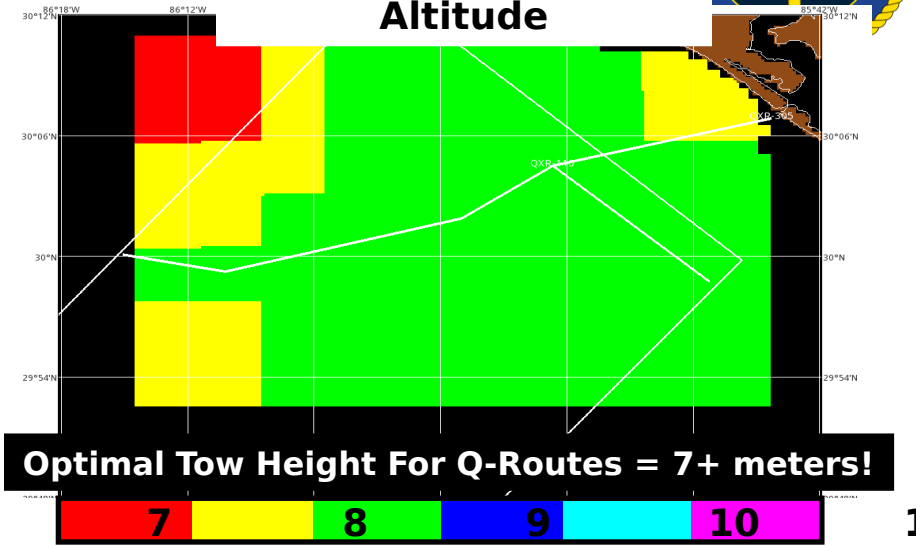
c .1 .2 .3 .4 .5 .6 .7 (1/m)
531nm .8 >1 meters
48 24 16 12 9.6 8 6.9
DiverVis 6 <4.8

3D Beam-c / Diver Visibility (West->East Transect / Surface 3D Slice)



c 531nm .1 .2 .3 .4 .5 .6 .7 (1/m)
DiverVis .8 >1 m
48 24 16 12 9.6 8 6.9
6 <4.8

Optimal Tow Altitude



Target Identification @ 7m/23.0ft Tow Altitude